Rice University
Civil and Environmental Engineering
CEVE 518 – APPLIED FLUID MECHANICS
FALL 2014 Syllabus

Classroom: Mech Lab 251.

Class meeting times:

Lectures: Tu Th 1 – 2:15 p.m.
Recitation (problem sessions): W 4 – 5 p.m.
Note: Recitation attendance is not required unless indicated but is strongly recommended.

Textbook:

Munson, Okiishi et al., *Fundamentals of Fluid Mechanics*, 7th edition, ISBN 978-1-118-11613-5 (Note: This is a newer version of the text - so if you borrow someone's from last year or the previous year, be sure to check numbers on problems covered in class or recitation or assigned for homework. Also, if you get the "international version" be sure to check all problems for units, dimensions, etc.).

Instructor

Phillip C. de Blanc, Ph.D., P.E.
262 Mech Lab, x4725
Mobile: 281-635-6069 (Emergencies only please!)
Email: pcd1@rice.edu

Office hours: W 1 – 3 p.m. *and by appointment*.

Course objectives; students should learn:

1. Basic definitions associated with fluid statics and dynamics;
2. Governing equations for conservation of mass and momentum;
3. Different approaches for understanding fluid mechanics of a system (control volume, differential analysis, dimensional analysis); and,
4. Engineering applications of fluid mechanics (pipe flow, flow over objects, open-channel flow, turbomachines).

Course outcomes expected: Students completing the course should be able to:

1. Define different properties governing fluid behavior.
2. Use relevant conservation equations to determine properties of fluid flow (average velocity, velocity profile, etc.).
3. Select appropriate methods to describe fluid systems quantitatively.
4. Apply fluid mechanical principles in the design of systems designed to transport or restrain fluids.

This course will address the following ABET objectives: Students must demonstrate:

1. An ability to apply knowledge of mathematics, science, and engineering;
2. An ability to analyze and interpret data;
3. An ability to design a system, component, or process to meet desired needs;
4. An ability to identify, formulate, and solve engineering problems;
5. An understanding of professional and ethical responsibility; and,
6. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

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Probable order of topics:

I. Introduction/Chapter 1 (Lectures 1-2)
II. Fluid Statics/Chapter 2 (Lectures 2-3, skip 2.7, 2.9)
III. Elementary Fluid Dynamics/Chapter 3 (Lectures 4-5)
IV. Fluid Kinematics/Chapter 4 (Lectures 5-6)
V. Control Volumes/Chapter 5 (Lectures 7-9, skip second law)
VI. Differential Analysis/Chapter 6 (Lectures 11-13, skip 6.5-6.7)
VII. Dimensional Analysis, Similarity/Chapter 7 (Lectures 13-14)
VIII. Pipe Flow/Chapter 8 (Lectures 15-17)
IX. Immersed Bodies/Chapter 9 (Lectures 19-20, skip some of 9.1)
X. Open Channel Flow/Chapter 10 (Lectures 21-22)
XI. Turbomachines/Chapter 12 (Lectures 23-24)

Class Requirements

Exams:

There will be 3 exams (each covering around 3-5 chapters - see schedule below). During the semester, exams will be posted a week before they are due; closed book (required equations, values, etc. will be provided) with specified time limits. The exams will be cumulative to the extent that material in the latter part of the semester depends on that covered previously. The last exam will be posted on the last day of class and due at the end of the period of the regularly scheduled exam block. The Honor Code will be enforced.

Homework:

Homework exercises will be assigned ~once per week (~one per chapter). A total of 8 assignments will be made during the semester. You are encouraged to work together though everyone is required to turn in their own copy of the assignment. Homeworks will be due at the start of class and accepted only by 5 p.m. on the due date. Ten points will be deducted if received later than the time due. If you have a problem for which an answer is provided in the back of the text book, you MUST show work clearly. No credit will be given for answers that "magically" appear after a bunch of nonsense. NOTE THAT THERE WILL BE SOME SECTIONS OF HOMEWORKS ON WHICH YOU ARE NOT ALLOWED TO WORK TOGETHER OR CONSULT OUTSIDE RESOURCES. THESE WILL BE NOTED CLEARLY, AND THE RICE HONOR CODE WILL BE ENFORCED.

Grading:

Exams (3)	75%
Homework	20%
Class participation	5%

Participation will be based on attendance and a somewhat subjective scale. Everyone will start at 100 for attendance; for an unexcused course absence, you lose 4 points (22 lectures + 3 reviews = 25; 100/25 = 4). However, don't think that you will get 100 if you show up every time but just sit there. Attendance grades will be scaled by participation. My scale: participates a lot 1.0, most of the time 0.9, sometimes 0.8, never 0.7. So if you participate a lot but miss one class, you get a 96. If you show up all the time but never say anything, you get a 70. If you

participate most of the time but miss two classes, you get an 83 (and so on). Note that absences may be excused at my discretion.

NOTE: Any student with a documented disability needing academic adjustments or accommodations is requested to speak with me during the first two weeks of class during office hours or by appointment. All discussions will remain confidential. Students with disabilities should also contact Disability Support Services in the Ley Student Center.

Class Schedule:

Date	Activity
26-Aug (Tue)	Lecture 1
27-Aug (Wed)	No recitation
28-Aug (Thu)	Lecture 2
1-Sep (Mon)	Labor Day - No classes
2-Sep (Tue)	Lecture 3 HW1 out (L1-3)
3-Sep (Wed)	Recitation 1 (L1-3)
4-Sep (Thu)	Lecture 4
5-Sep (Fri)	Add/declare audit day
9-Sep (Tue)	Lecture 5 HW1 due HW2 out (L4-5)
10-Sep (Wed)	Recitation 2 (L4-5)
11-Sep (Thu)	Lecture 6
16-Sep (Tue)	Lecture 7 HW2 due HW3 out (L6-7)
17-Sep (Wed)	Recitation 3 (L6-7)
18-Sep (Thu)	Lecture 8
23-Sep (Tue)	Lecture 9 HW3 due HW4 posted (L8-9)
24-Sep (Wed)	Recitation 4 (L8-9)
25-Sep (Thu)	Lecture 10 (Review)
29-Sep (Mon)	EX1 posted
30-Sep (Tue)	No class HW4 due
1-Oct (Wed)	No recitation
2-Oct (Thu)	No class
6-Oct (Mon)	EX1 due by 5PM
7-Oct (Tue)	Lecture 11
8-Oct (Wed)	No recitation
9-Oct (Thu)	Lecture 12
10-Oct (Fri)	Drop day
14-Oct (Tue)	Midterm recess - no class
15-Oct (Wed)	Recitation 5 (L11-12)
16-Oct (Thu)	Lecture 13 HW5 out (L11-13)

Date	Activity
21-Oct (Tue)	Lecture 14
22-Oct (Wed)	Recitation 6 (L13-14)
23-Oct (Thu)	Lecture 15
28-Oct (Tue)	Lecture 16 HW5 due HW6 out (L14-16)
29-Oct (Wed)	Recitation 7 (L15-16)
30-Oct (Thu)	Lecture 17
31-Oct (Fri)	Pass/fail day
3-Nov (Mon)	EX2 posted
4-Nov (Tue)	Lecture 18 (Review) HW6 due
5-Nov (Wed)	No recitation
6-Nov (Thu)	Lecture 19
10-Nov (Mon)	EX2 due by 5PM
11-Nov (Tue)	Lecture 20 HW7 out (L19-20)
12-Nov (Wed)	Recitation 8 (L19-20)
13-Nov (Thu)	Lecture 21
18-Nov (Tue)	Lecture 22 HW7 due
19-Nov (Wed)	Recitation 9 (L21-22)
20-Nov (Thu)	Lecture 23 HW8 out (L21-23)
25-Nov (Tue)	No class
26-Nov (Wed)	No recitation
27-Nov (Thu)	Thanksgiving Holiday - no class
2-Dec (Tue)	Lecture 24
3-Dec (Wed)	No recitation
4-Dec (Thu)	EX3 posted
5-Dec (Fri)	Last day of classes
6-Dec (Sat)	Study days begin
9-Dec (Tue)	Study days end
10-Dec (Wed)	First day of final exams
17-Dec (Wed)	Last day of final exams